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THE

Scholar's Aſſiſtant.

INTRODUCTION.

Of Arithmetic in general.

MASTER. WHAT is Arithmetic?

SCHOLAR. Arithmetic is the Art or Science of computing by Numbers; it is called vulgar or common Arithmetic when it treats of whole Numbers.

M. What is Number?

S. Number is one or more quantities, anſwering to the Queſtion, How many?

M. What is Arithmetic in Whole Numbers?

S. Arithmetic in Whole Numbers, ſuppoſes it's Numbers to be entire Quantities, without any parts annexed.

M. What is Arithmetic in Fractions?

S. Arithmetic in Fractions, ſuppoſes it's Numbers to be the parts of ſome entire Quantity.

M. How is Arithmetic conſidered with regard to Art and Science?

S. Both in Theory and Practice.

M. What is Arithmetic in Theory?

S. Arithmetic in Theory conſiders the Nature and Quality of Numbers, and demonſtrates the

Reaſon of Practical Operations. And in this Senſe Arithmetic is a Science.

M. What is Practical Arithmetic?

S. Practical Arithmetic is that which ſhews the Method of working by Numbers, ſo as to be moſt uſeful and expeditious in Buſineſs. And in this Senſe Arithmetic is an Art.

M. What is the Nature of all Arithmetical Operations?

S. The Nature of all Arithmetical Operations is, by certain Quantities that are given, to find out others that are required.

M. Pray which are the Principal, or Fundamental Rules in Arithmetic?

S. Theſe Five; Numeration, Addition, Subtraction, Multiplication, and Diviſion.

M. Why are they called the Fundamental Rules?

S. Becauſe no Operation in Arithmetic can be performed, without the uſe of one or more of them.

NUMERATION.

M. WHAT is Numeration or Notation?

S. It is the Art of expreſſing Numbers by certain Characters or Figures.

M. What does Numeration teach?

S. It teaches to read or expreſs the true Value of any Number when written down, and conſequently to write down any propoſed Number according to its true Value.

M. What Characters or Figures are Numbers uſually expreſſed by; S. By

S. By Arabic Figures and the Latin Letters.

M. How are the Arabic Figures expreſs'd ?

S. The Arabic Figures are thus expreſs'd ; One 1, Two 2, Three 3, Four 4, Five 5, Six 6, Seven 7, Eight 8, Nine 9, Nought or Cypher 0, And this is the Notation, or reading and writing of every ſingle Figure.

M. How far may the Uſe of theſe Figures be extended.

S. Theſe ten Characters or Figures may be uſed to expreſs all manner of Numbers, from the leaſt to the greateſt that can be conceived ; even without End.

M. How many Figures are ſufficient to expreſs moſt ordinary Concerns ?

S. Nine ; and therefore the Numeration Table commonly extends only to nine places.

M. Why does it conſiſt of nine places rather than of eight or ten ?

S. Becauſe they make up three even Periods.

M. What do you mean by a Period ?

S. A Period is a Quantity expreſs'd by Three Figures, the firſt to the right hand ſignifying ſo many Units, the ſecond ſo many Tens, and the third ſo many Hundreds.

M. Why are three Figures called a Period ?

S. Becauſe if the Number be increaſed above three places, there is ſtill ſome periodical Return of the Value of thoſe Places, and every third Figure to the left Hand, will always be Hundreds, if it be ever ſo far extended.

M. Pray is Unit or One, a number ?

S. Yes, an Unit is a number, becauſe it may properly

properly anſwer the Queſtion, How many?

M. Give me an Example?

S. If I am aſk'd how many Gods there are? I anſwer, One; how many Sundays in a Week? the anſwer is, One.

M. In what proportion of Value do Numbers increaſe, from the Units place to the left hand?

S. By Tens.

M. How muſt they be Read?

S. From the left to the right hand.

M. Suppoſe you have two Figures given to be read together, how do you Value them?

S. The firſt Figure to the right hand is Units, and the next ſo many Tens, as 89, Eighty-nine.

M. Suppoſe three Figures, or a whole Period be given, how are they to be valued?

S. Beginning at the laſt Figure on the right hand, I value them Units, Tens, Hundreds; 789, Seven Hundred and Eighty-nine.

M. How do you Value ſix Figures or two Periods?

S. Beginning at the laſt Figure on the right hand as before, I ſay Units, Tens, Hundreds, Thouſands, Tens of Thouſands, Hundreds of Thouſands, 456 789, four Hundred and fifty-ſix Thouſand, ſeven Hundred and Eighty-nine.

M. Let me hear you repeat the nine Figures or three Periods together?

S. 123 456 789.

NUMERATION TABLE.

9	Units	1
89	Tens	10
789	Hundreds	100
6 789	Thouſands	100 0
56 789	X of Thouſands	100 00
456 789	C of Thouſands	100 000
3 456 789	Millions	100 000 0
23 456 789	X of Millions	100 000 00
123 456 789	C of Millions	100 000 000

THE NOTATION OF NUMBERS BY ROMAN OR LATIN LETTERS.

I One
II Two
III Three
IV Four
V Five
VI Six
VII Seven
VIII Eight
IX Nine
X Ten
XI Eleven
XII Twelve
XIII Thirteen
XIV Fourteen
XV Fifteen
XVI Sixteen
XVII Seventeen
XVIII Eighteen
XIX Nineteen
XX Twenty
XXX Thirty
XL Forty
L Fifty
LX Sixty
LXX Seventy
LXXX Eighty
XC Ninety
C Hundred
CC Two Hundred
CCC Three Hundred
CCCC Four Hundred
D Five Hundred
DC Six Hundred
DCC Seven Hundred
DCCC Eight Hundred
DCCCC Nine Hundred
M One Thouſand
MDCCLXXXVI One Thouſand Seven Hundred and Eighty-ſix.

M. WHAT is the uſe of Addition?

S. Addition teacheth to bring ſeveral Numbers into one Sum, called the Total.

M. How many ſorts of Addition are there?

S. Two; Simple and Compound.

M. What is Simple Addition?

S. Simple Addition is the adding together ſeveral Numbers whoſe ſignification is the ſame, as 8 Yards and 9 Yards make 17 Yards.

M. Suppoſe you have ſeveral Numbers given to be added into one Sum, how are they to be placed?

S. I muſt take particular care to place Units under Units, Tens under Tens, &c.

M. How may Addition be proved?

S. By two Methods; one is, by adding the whole Sum up firſt, and then cut off the top line, and add the Sum up again without it, and by adding the lower Sum and the top Line together, their ſum will be equal to the firſt adding if the work is right.

M. What is the other Method of proving Addition?

S. By beginning at the top of the Sum and reckoning the figures downwards, in the ſame manner they were added upwards, and if the ſecond line be equal to the firſt, it is right.

M. What is Compound Addition?

S. Compound Addition is the adding of ſeveral Sums together, having divers Denominations, as in Money, Weights, and Meaſures.

M. What are the Denominations of Engliſh Money?

S. 4 Farthings

S. 4 Farthings make 1 Penny.
12 Pence — — 1 Shilling.
20 Shillings — 1 Pound.

M What other Names of Money are now in Uſe with us?

		s.	d.
S. A Guinea, which is	—	21	0
Half Guinea	—	10	6
Quarter Guinea	—	5	3
Crown —	—	5	0
Half Crown —	—	2	6

Note, There are alſo ſeveral ſmaller Pieces which ſpeak their own Value, as, a Six-pence, Four-pence, Three-pence, Two-pence, Penny, Half-penny, and Farthing.

M. Let me hear you repeat the Pence Tables?

	d.		s.	d.		s.		d.
S.	20	is	1	8		2	is	24
	30	—	2	6		3	—	36
	40	—	3	4		4	—	48
	50	—	4	2		5	—	60
	60	—	5	0		6	—	72
	70	—	5	10		7	—	84
	80	—	6	8		8	—	96
	90	—	7	6		9	—	108
	100	—	8	4		10	—	120
	110	—	9	2		11	—	132
	120	—	10	0		12	—	144

SUBTRACTION.

M. WHAT is the Uſe of Subtraction?

S. By taking a leſſer Number from a greater

greater, it ſhews the remainder or difference between both.

M. How many ſorts of Subtraction are there?

S. Two; Simple and Compound.

M. What is Simple Subtraction?

S. Simple Subtraction is the finding a difference between any two Numbers whoſe ſignification is the ſame; as the difference between 5 Yards and 9 Yards is 4 Yards.

M. What are you to obſerve in placing the Numbers for Subtraction?

S. The ſame as in Addition; I am to be particular in placing Units under Units, Tens under Tens, &c.

M. What Rule have you for the operation of Subtraction?

S. When the lower Number is greater than the upper, I muſt take the lower Number from the Number which I borrow, and to that difference add the upper Number, carrying 1 to the next lower place.

M. What Number will you borrow when the lower Number is the greater?

S. Suppoſing the lower Figure to be 9, and the upper Figure to be 6, I ſay 9 from 6 I cannot, but 9 from 10 there remains 1, and the 6 is 7; I therefore ſet down 7 and carry 1.

M. How do you prove Subtraction?

S. By adding the Remainder and the leſſer Line together, which will be equal to the greater Line. Or, by Subtracting the Remainder from the greater Line, and that difference will be equal to the leſſer Line.

M. What

M. What is Compound Subtraction?

S. Compound Subtraction is to find the difference between any two Sums of divers Denominations, as in Money, Weights, and Meaſures.

MULTIPLICATION.

M. WHAT is Multiplication?

S. Multiplication is a compendious, or ſhort way of performing ſeveral Additions.

M. How many terms, or parts, are there in Multiplication, which are neceſſary to be known?

S. Three, viz.

1. The MULTIPLICAND, or Number to be Multiplied.
2. The MULTIPLIER, or Number by which I am to multiply.
3. The PRODUCT, or Total of the Multiplicand as often as there are Units in the Multiplier.

The Multiplicand and Multiplier, are alſo called Factors.

M. How many ſorts of Multiplication are there?

S. Two; Simple and Compound.

Simple MULTIPLICATION.

M. What is Simple Multiplication?

S. Simple Multiplication is the multiplying of any two Numbers together, without reſpect to their ſignification; as 7 times 5 is 35.

M. Let me hear you repeat the Multiplication Table?

S. 2 times	2	is	4	5 times	8	is	40
	3	-	6		9	-	45
	4	-	8		10	-	50
	5	-	10		11	-	55
	6	-	12		12	-	60
	7	-	14	6 times	6	is	36
	8	-	16		7	-	42
	9	-	18		8	-	48
	10	-	20		9	-	54
	11	-	22		10	-	60
	12	-	24		11	-	66
3 times	3	is	9		12	-	72
	4	-	12	7 times	7	is	49
	5	-	15		8	-	56
	6	-	18		9	-	63
	7	-	21		10	-	70
	8	-	24		11	-	77
	9	-	27		12	-	84
	10	-	30	8 times	8	is	64
	11	-	33		9	-	72
	12	-	36		10	-	80
4 times	4	is	16		11	-	88
	5	-	20		12	-	96
	6	-	24	9 times	9	is	81
	7	-	28		10	-	90
	8	-	32		11	-	99
	9	-	36		12	-	108
	10	-	40	10 times	10	is	100
	11	-	44		11	-	110
	12	-	48		12	-	120
5 times	5	is	25	11 times	11	-	121
	6	-	30		12	-	132
	7	-	35	12 times	12	-	144

CASE

CASE I.

M. What are you to obſerve in the firſt Caſe of Multiplication?

S. I am to obſerve that the Factors, (or Multiplicand and Multiplier) be placed in ſuch manner that Units may ſtand under Units, Tens under Tens, &c. and then draw a line under them.

M. Very right; and having ſo done, how do proceed in working them? Suppoſe you are to Multiply 1785 by 2?

S. Having placed the 2 under the 5, I ſay 2 times 5 is 10—Nought or 0 and carry 1; 2 times 8 is 16, and the 1 I carry is 17—7 and carry 1; 2 times 7 is 14 and 1 is 15—5 and carry 1; 2 times 1 is 2, and 1 I carry is 3; ſo that the Product of 1785, multiplied by 2, is 3570.

CASE II.

M. What do you obſerve in the ſecond Caſe of Multiplication?

S. 1. When the Multiplier conſiſts of more Figures than one, there muſt be made as many ſeveral Products as there are Figures in the Multiplier.

2. The firſt Figure of every Product muſt be placed exactly under its Multiplier.

3. All the Products are to be added together, and their Sum will be the total Product.

M. How do you prove Multiplication?

S. By caſting the Nines out of the two Factors, and the total Product; thus: I make a croſs upon my Slate, and firſt caſt the Nines out of the Multiplicand, ſetting down the remainder on the left hand of the croſs; and then proceed in the ſame manner with the Multiplier, and ſetting that remainder

mainder on the right hand of the croſs; I am then to multiply thoſe two Figures together, and caſting out the Nines, I ſet the remainder at the top of the croſs; then caſt the Nines out of the Product, and if the remainder is the ſame Figure with that I ſet at the top of the croſs, I may conclude the Sum is right.

M. Yes, you may ſuppoſe the Sum to be right, but that method of Proof is not always to be depended upon; for ſometimes it will prove thus, and yet the Sum may not be right. Is there no other Method of proving Multiplication?

S. Yes; Multiplication and Diviſion will prove each other; and Multiplication may be proved by itſelf, by inverting the Factors, that is, by making the Multiplicand the Multiplier.

M. What do you obſerve in this Caſe, when 1 and 1, or 1 and 2, happen together in the Multiplier; for inſtance, ſuppoſe you are to multiply by 114, or by 512?

S. I may multiply by 11 or 12 at once.

M. When any Number between 12 and 20 happens to be your Multiplier, how will you multiply by them.

S. I muſt multiply by the Figure in Units place, and as I multiply, add to the Product of each ſingle Figure that of the Multiplicand, which ſtands next on the right Hand.

CASE III.

M. What do you obſerve in the third Caſe of Multiplication?

S. 1. Such Factors as have Cyphers at the ends, muſt be ſet one under another, as if there were no Cyphers. 2. The

2. The Cyphers placed at the end of either or both of the Factors, are to be omitted till the laſt Product, and then the ſame number of Cyphers muſt be annexed to it.

CASE IV.

M. What are you to obſerve in the fourth Caſe of Multiplication?

S. If Cyphers are placed between the Figures in the Multiplier, they are to be omitted in the Operation: Regard being had to place the firſt Figure of every particular Product under its reſpective Multiplier.

CASE V.

M. How will you multiply by the Parts of any Number inſtead of the Whole?

S. When the Multiplier is ſuch a Number that any two Figures being multiplied together, will make the ſaid Multiplier; I may multiply the given Number by one of thoſe Figures, and that Product by the other.

Compound MULTIPICATION.

M. What is Compound Multiplication?

S. When ſeveral Numbers of divers denominations (as in Money, Weights, and Meaſures) are given to be multiplied by one common Multiplier; it is called Compound Multiplication?

DIVISION.

M. WHAT is Diviſion?

S. It is a compendious, or ſhort way of performing ſeveral Subtractions, ſhewing how oft

oft one Number is contained in another, and what remains.

M. How many Parts are there in Diviſion?

S. Four, viz.

1. The Dividend, or Sum to be divided.

2. The Diviſor, or Sum divided by.

3. The Quotient, or Anſwer to the Queſtion.

4. The Remainder, which is always leſs than the Diviſor, and of the ſame Name with the Dividend.

M. How many ſorts of Diviſion are there?

S. Two; Simple and Compound.

Simple DIVISION.

M. What is Simple Diviſion?

S. Simple Diviſion is when the Diviſor and Dividend are made choice of, without any regard to their ſignification; as 72 divided by 8 gives 9 for the Quotient; or the Number 8 is contained in 72 nine times.

M. How many ſorts of Simple Diviſion are there?

S. Two; Short Diviſion and Long Diviſion.

Short Diviſion.

M. What is Short Diviſion?

S. Short Diviſion is when the Diviſor does not exceed 12.

M. How is Diviſion proved?

S. By multiplying the Quotient by the Diviſor, and adding the Remainder (if there be any) to the Product; that Sum will be equal to the Dividend.

Long Diviſion.

CASE I.

M. What is Long Diviſion?

S. When

S. When the Diviſor is more than 12, for help of the Memory, we are obliged to multiply the Quotient Figure and Diviſor together, and ſubtract that Product from the Dividend, in order to find the Remainder; which Operation is to be continued to every Quotient Figure: and this is called Long Diviſion.

CASE II.

M. What do you obſerve of Cyphers placed at the end of the Diviſor?

S. They muſt be cut off; and the ſame Places alſo muſt be cut off in the Dividend.

2. Thoſe Figures which are cut off in the Dividend, muſt be annexed to the Remainder at laſt.

CASE III.

M. How do you divide by the Parts of any Number inſtead of the Whole?

S. When the Diviſor is ſuch a Number that any two Figures being multiplied together, will make the ſaid diviſor, it is ſhorter to divide the given Number by one of thoſe Figures, and that Quotient by the other; as 5 times 7 is 35.

Compound DIVISION.

M. What is Compound Diviſion?

S. When ſeveral Numbers of divers denominations are given to be divided by one common diviſor; this is called Compound Diviſion.

REDUCTION.

M. WHAT is Reduction?

Reduction is the bringing or reducing Numbers

Numbers of one denomination into other Numbers of another denomination, but of the ſame Value.

M. How are Denominations of any kind reduc'd from one to another?

S. By Multiplication and Diviſion.

M. When is Multiplication to be uſed?

S. When great Names are to be brought into ſmall; as Pounds into Shillings, or Days into Hours, and this is called Reduction deſcending.

M. When is Diviſion to be uſed?

S. When ſmall Names are to be brought into great; as Shillings into Pounds, or Hours into Days, and this is called (though improperly) Reduction aſcending.

Note, Whether I multiply or divide, it muſt be by as many of the leſs as make one of the greater denomination.

M. How are Queſtions in Reduction proved?

S. By varying the Order of them.

WEIGHTS *and* MEASURES.

TROY WEIGHT.

M. What are the Denominations of TROY WEIGHT?

S. 24 Grains make 1 Pennyweight.
20 Pennyweights — 1 Ounce.
12 Ounces — — 1 Pound.

M. What Things are uſually weighed by this Weight?

S. Gold, Silver, Jewels, Electuaries, and all Liquors.

M. What

M. What is the Standard for Gold?

S. 22 Carrats of fine Gold, and 2 Carrats of Copper being melted together, are eſteemed the true Standard for Gold Coin.

M. What is a Carrat?

S. A Carrat is not any certain Quantity, or Weight, but the 24th part of any Quantity or Weight.

M. What is the Standard for Silver?

S. 11oz. 2dwts. of fine Silver and 18dwts. of Copper being melted together, are eſteemed the true Standard for Silver Coin.

M. What is the Value of Gold and Silver by the Pound, Ounce, &c.

S.	1. Of GOLD.		2. Of SILVER.	
		l. s. d.		l. s. d.
1	Pound is worth	48 0 0	——	3 0 0
1	Ounce —	4 0 0	——	0 5 0
1	Pennyweight -	0 4 0	——	0 0 3
1	Grain —	0 0 2	——	½ a Farthing.

AVOIRDUPOIS WEIGHT.

M. What are the Denominations of Avoirdupois Weight?

S. 16 Drams make 1 Ounce.
16 Ounces — 1 Pound.
28 Pounds - 1 Quarter of an Hundred.
4 Quarters -- 1 Hundred Weight.
20 Hundred - 1 Ton.

M. What is the Uſe of Avoirdupois Weight?

S. Avoirdupois Weight is uſed in Weighing any thing of a coarſe and droſſy Nature; as all

Groceries and Chandlers Wares; and all Metals except Silver and Gold; alſo Bread, Butter, Cheeſe, Butchers Meat, &c.

M. What other Denominations are in this Weight?

S. There are ſeveral other Denominations in Avoirdupois Weight in ſome particular Goods, and others only cuſtomary in ſome particular Places.

M. Theſe are very neceſſary to be known and remembered, therefore repeat them.

	lb.
S. A Firkin of Butter is	56
A Firkin of Soap	64
A Barrel of Pot-Aſh	200
A Barrel of Anchovies	30
A Barrel of Soap	256
A Barrel of Butter	224
A Barrel of Raiſins	112
A Barrel of Gunpowder	112
A Stone of Butchers Meat	8
A Stone of Glaſs	5
A Gallon of Train Oil	7½
A Stone of Iron or Shot, or Horſeman's Weight	14
A Clove of Wool	7
A Stone of Wool	14
A Tod	28
A Wey is 6 Tod 1 Stone, or	182
A Pack	340
A Puncheon of Prunes	is 10 or 12 C
A Fother of Lead	19 C. 2 qrs.
A Quire of Paper	24 Sheets
A Ream of Ditto	20 Quires

APOTHECARIES

APOTHECARIES WEIGHT.

M. What are the Denominations of Apothecaries Weight?

S. 20 Grains	make	1 Scruple.
3 Scruples	—	1 Dram.
8 Drams	—	1 Ounce.
12 Ounces	—	1 Pound.

M. What is the Uſe of Apothecaries Weight?

S. It is what the Apothecaries compound their Medicines by, but they buy and ſell their commodities by Avoirdupois Weight.

Note, The Apothecaries Pound and Ounce, and the Pound and Ounce Troy, are the ſame, only differently divided and ſub-divided.

LONG MEASURE.

M. What are the Denominations of Long Meaſure?

S. 3 Barley-Corns	make	1 Inch.
4 Inches	—	1 Hand.
12 Inches	—	1 Foot.
3 Feet or 36 Inches	—	1 Yard.
6 Feet	—	1 Fathom.
5 Yards and a half	-	1 Rod, Pole, or Perch.
40 Poles or 220 yards	—	1 Furlong.
8 Furlongs or 1760 yards	—	1 Mile.
3 Miles	—	1 League.
60 Miles	—	1 Degree.

Note, A Degree is 69 Miles and 4 Furlongs nearly, though commonly reckoned but 60 Miles.

M. What is the Uſe of Long Meaſure?

S. Long Meaſure is uſed to meaſure Diſtances of Places

Places or any Thing elſe where Length is conſidered without regard to Breadth.

M. Is the Pole or Perch always the ſame in Length?

S. No Sir, Five Yards and a half are the Statute Meaſure for a Pole or Perch; but for Fens and Woodlands it is the cuſtom to reckon 18 Feet to the Pole, and for Foreſts 21 Feet.

M. What is the uſe of an Hand?

S. It is uſed to meaſure Horſes.

M. What is the Uſe of a Fathom?

S. It is uſed to meaſure Depths.

M. How many Degrees are the circumference of the Globe?

S. 360.

CLOTH MEASURE.

M. What are the Denominations of Cloth Meaſure?

S.

2 Inches and $\frac{1}{4}$	make	1 Nail.
4 Nails	—	1 Quarter of a Yard.
4 Quarters	—	1 Yard.
3 Quarters of a Yard		1 Ell Flemiſh.
5 Quarters	—	1 Ell Engliſh.
6 Quarters	—	1 French Ell.

Note, The Yard is uſed in meaſuring all ſorts of Woollen Cloths, wrought Silks, moſt Linens, Tape and Gartering.

2. The Ell Engliſh is uſed only in meaſuring ſome particular Linens, called Hollands.

3. The Ell Flemiſh is uſed in meaſuring Tapeſtry.

LAND

LAND MEASURE.

M. What are the Denominations of Land Meaſure?

S. 9 Square Feet make 1 Yard.
30 Yards and a quarter — 1 Pole.
40 Poles in length and 1 in breadth, 1 Rood.
4 Roods — 1 Acre.

M. What is the Uſe of Land Meaſure?

S. It gives the Content of any piece of Ground in Acres.

M. How is Land meaſured?

S. Land is commonly Meaſured by a Chain called Gunter's, whereof 10 in length and 1 in breadth are an Acre of Land, being equal to 4840 Yards.

WINE MEASURE.

M. What are the denominations of Wine Meaſure?

S. 2 Pints make 1 Quart.
4 Quarts — 1 Gallon.
10 Gallons — 1 Anchor of Brandy or Rum.
18 Gallons — 1 Runlet.
31½ Gallons — 1 Barrel.
42 Gallons — 1 Tierce.
63 Gallons — 1 Hogſhead.
84 Gallons — 1 Puncheon.
2 Hhds. or 126 Gallons - 1 Pipe or Butt.
2 Pipes or 4 Hogſheads - 1 Tun.

Note, A Gallon of Wine is 231 ſolid Inches.

M. What other Liquors are uſually Meaſured by the Wine Standard?

S. All

S. All ſpirits, ſtrong waters, cyder, mead, perry, vinegar, honey, and oil.

M. What is a tun of wine computed to weigh?

S. 18 cwt. Avoirdupois.

WINCHESTER MEASURE.

M. What are the Denominations of Wincheſter Meaſure?

S. 2 Pints	make	1 Quart.
4 Quarts	—	1 Gallon.
8½ Gallons	—	1 Firkin of ale or beer
2 Firkins	—	1 Kilderkin.
4 Firkins or 34 galls.	—	1 Barrel.
1½ Barrel or 51 galls.	—	1 Hogſhead.

Note, In London only they compute 8 gallons to the firkin of ale, and 9 gallons to the firkin of beer, but in all other parts of England for ale and beer, 34 gallons are computed to the barrel, and 8 gallons and a half to the firkin.

A gallon of ale or beer is 282 ſolid inches.

DRY MEASURE.

M. What are the Denominations of Dry Meaſure?

S. 2 Pints	make	1 Quart.
4 Quarts	——	1 Gallon.
2 Gallons	——	1 Peck.
4 Pecks	——	1 Buſhel.
8 Buſhels	——	1 Quarter of Corn.
36 Buſhels	——	1 Chaldron of Coals.

Note, In London 36 buſhels make a chaldron, but in all other places 32 buſhels make a chaldron. The buſhel in water meaſure contains 5 pecks.

M. What

M. What other Denominations are there in Dry Meaſure?

S. A Score of Coals	is	21 Chaldron.
Sack of Coals	—	3 Buſhels.
Farmer's Bag of wheat	—	3 Buſhels.
——— Bag of Barley	—	4 Buſhels.
Sack of Corn	—	5 Buſhels.
Wey	—	48 Buſhels.
Load	—	40 Buſhels.

M. What is the Uſe of Dry Meaſure?

S. Dry Meaſure is applied to all dry goods, as corn, ſeeds, fruit, roots, ſalt, ſand, ſea coal, and charcoal.

M. What is the Standard for Dry Meaſure?

S. The ſtandard for Dry Meaſure is a Wincheſter buſhel, being 18 inches and a half wide, and 8 inches deep.

T I M E.

M. What are the Denominations of Time?

S. 60 Seconds	make	1 Minute.
60 Minutes	——	1 Hour.
24 Hours	——	1 Day.
7 Days	——	1 Week.
4 Weeks or 28 days	——	1 Month.

13 Months, 1 Day, and 6 Hours,— 1 Common or Julian Year.

M. What is a ſolar Year?

S. According to the beſt computations, a ſolar year is 365 days, 5 hours, 48 minutes, and 55 ſeconds.

M. How is the year divided by the Calendar?

S. Thirty Days hath September,
April, June, and November;

February

February hath 28 alone,
And all the reſt thirty-one;
Except in Leap Year, and then's the time,
That February hath twenty-nine.

M. How may you know when its Leap Year?

S. When I can divide the Year of our Lord by 4 without having any remainder, it is then called Biſextile or Leap Year; but if 1, 2, or 3 remains, it is ſo many years after.

SOLID MEASURE.

M. What are the Denominations of Solid Meaſure?

S. 1728 Solid Inches make 1 Solid Foot.
27 Feet — 1 Yard.
40 Feet of round Timber or 50 of hewn, make 1 Ton or Load.
A ſolid yard of Earth is called a load.

M. What is a ſtatute cord of wood?

S. It is a pile, 8 feet long, 4 feet broad, and 4 feet high, conſequently its contents are 128 feet.

M. What is the Uſe of Solid Meaſure?

S. It is uſed to meaſure all things, in which are conſidered length, breadth, and depth or thickneſs.

The SINGLE RULE *of* THREE.

M. By what is the Single Rule of Three known?

S. By having always three numbers or terms given to find a fourth.

M. Suppoſe

M. Suppoſe any of the given terms are of ſeveral denominations, what do you obſerve concerning them?

S. If any of the given terms are of ſeveral denominations, they muſt be reduced to the loweſt denomination mentioned.

M. What are you to obſerve reſpecting the firſt and third terms?

S. The firſt and third terms muſt be of the ſame name and kind.

M. What of the fourth term.

S. The fourth term muſt be of the ſame name and kind with the ſecond.

M. What are you to obſerve concerning the three terms taken together?

S. I am to obſerve that the two firſt terms are a ſuppoſition, and the laſt is a demand.

M. How are you to know the third term?

S. The third term is known by theſe words, what coſt? what will? how much? how many?

M. How many ſorts of Proportion are there?

S. Two; Direct and Inverſe.

DIRECT PROPORTION.

M. What do you underſtand by Direct Proportion?

S. Direct Proportion is when more requires more or leſs requires leſs.

M. What do you mean by more requires more?

S. More requires more is when the third term is greater than the firſt; and therefore requires the

fourth term to be greater than the ſecond in the ſame proportion.

M. What do you mean by leſs requires leſs?

S. Leſs requires leſs is when the third term is leſs than the firſt; and therefore requires the fourth term to be leſs than the ſecond in like proportion.

M. How will you find the fourth term in direct proportion?

S. By multiplying the ſecond and third terms together, and dividing that product by the firſt term.

M. What proportion does the fourth term bear to any other?

S. It bears the ſame proportion to the ſecond as the third does to the firſt.

M. How will you prove queſtions in this rule?

S. By changing their order as in the annexed

Example.

lb.		d.		lb.	
If 1 of Sugar coſt		$5\frac{3}{4}$	what will	56	coſt?
		4		23	
		23		168	
				112	
				4)1288	
Anſwer, 1l. 6s. 10d.				12) .322	
				26s.	10d.

To

To prove this I change the order of the queſtion, thus: lb. s. d. lb,

If 56 coſt 26 10 what will 1 coſt?

12

—— d.

56)322(5¾ Anſwer.
280

42
4

56)168(¾
168

INVERSE PROPORTION.

M. What is Inverſe Proportion?

S. Inverſe Proportion is when more requires leſs or leſs requires more.

M. What is meant by more requires leſs?

S. More requires leſs, is when the third term is greater than the firſt, and requires the fourth term to be leſs than the ſecond.

M. What is meant by leſs requires more?

S. Leſs requires more, is when the third term is leſs than the firſt, and requires the fourth term to be greater than the ſecond.

M. How is the fourth term in Inverſe Proportion found?

S. By multiplying the firſt and ſecond terms together, and dividing the product by the third term.

M. What

M. What proportion does the fourth term bear to any of the reſt?

S. It bears ſuch proportion to the ſecond as the firſt does to the third.

M. How will you ſtate and work this example? If 12 men can perform a piece of work in 6 days, how many men can do the ſame in 24 days?

S. If 6 days require 12 men, how many men will 24 days require? multiply the firſt and ſecond numbers together, and divide that product by 24, the third number, and the anſwer is 3 men; and by varying the operation I ſhall have the proof.

d. m. d.
If 6 —— 12 —— 24
6

24)72(3 Men. Anſwer.
72

Proof.

d. m. d.
If 24 —— 3 —— 6
3

6)72

12 Men. Anſwer.

THE

PRACTICE.

M. WHAT is Practice?

S. It is a ſhort way of finding the value of any quantity of goods at a given price.

M. How are queſtions in this rule proved?

S. By the Rule of Three direct, or Practice may be proved by itſelf, by varying the parts.

M. Let me hear you repeat the tables of

ALIQUOT PARTS.

S. The Even Parts of MONEY.

Of a POUND.

s.	d.		
10	0	— is the —	$\frac{1}{2}$
6	8	——	$\frac{1}{3}$
5	0	——	$\frac{1}{4}$
4	0	——	$\frac{1}{5}$
3	4	——	$\frac{1}{6}$
2	6	——	$\frac{1}{8}$
2	0	——	$\frac{1}{10}$
1	8	——	$\frac{1}{12}$
1	0	——	$\frac{1}{20}$

Of a SHILLING.

d.			
6	— is the	—	$\frac{1}{2}$
4	——	——	$\frac{1}{3}$
3	——	——	$\frac{1}{4}$
2	——	——	$\frac{1}{6}$
$1\frac{1}{2}$	——	——	$\frac{1}{8}$
1	——	——	$\frac{1}{12}$

The Even Parts of WEIGHT.

Of a TON.

cwt.		
10	is the	$\frac{1}{2}$
5	——	$\frac{1}{4}$
4	——	$\frac{1}{5}$
$2\frac{1}{2}$	——	$\frac{1}{8}$
2	——	$\frac{1}{10}$
1	——	$\frac{1}{20}$

Of an HUND.

lb.		
56	is the	$\frac{1}{2}$
28	——	$\frac{1}{4}$
16	——	$\frac{1}{7}$
14	——	$\frac{1}{8}$
8	——	$\frac{1}{14}$
7	——	$\frac{1}{16}$

Of a QUARTER.

lb.		
14	is the	$\frac{1}{2}$
7	——	$\frac{1}{4}$
4	——	$\frac{1}{7}$
$3\frac{1}{2}$	——	$\frac{1}{8}$

CASE

CASE I.

M. What muſt be done with the price of an Integer, when it is leſs than a penny?

S. I muſt find the aliquot part or parts of that price contained in a penny, which muſt be diviſors to the given ſum; that is, if the price be a farthing, I muſt ſay a farthing is the fourth of a penny; if the price be a halfpenny, I muſt ſay, a halfpenny is the half; if it be three farthings, I muſt ſay a halfpenny is the half of a penny, and a farthing the fourth of a penny, or a farthing the half of a halfpenny.

M. How will you perform the operation, when the price of any article is at a farthing per pound, yard, &c.

S. If the price be a farthing, the given quantity will conſequently be ſo many farthings, and a farthing being the fourth of a penny, and a penny the twelfth of a ſhilling, and a ſhilling the twentieth of a pound; the diviſors will be 4, 12, and 20, as in the annexed

Example.

¼	¼	1148 Yards at ¼ per yard.
	12	287
	2|0	2|3—11
		11. 3s. 11d.

CASE

CASE II.

M. What muſt be done when the price is leſs than a Shilling?

S. Find the aliquot part or parts of that price contained in a ſhilling, which muſt be diviſors to the given ſum, then add the quotients together, (when there is more than one) and the ſum will be the anſwer in ſhillings, which divided by 20 will give pounds.

CASE III.

M. What muſt you do when the price is more than one ſhilling, but leſs than two ſhillings?

S. Let the given quantity ſtand for ſhillings, and take parts with the reſt of the price.

CASE IV.

M. What will you do when the price is any even number of ſhillings under 20, as 4, 6, 8, 12, &c.

S. Multiply the given quantity by half the price, doubling the firſt figure of the product for ſhillings, and the reſt of the product will be pounds.

NOTE, If the price is 10s. you may take half the quantity and it is done, and if there ſhould be any remainder it will be 10s.

CASE V.

M. Suppoſe the price is an odd number of ſhillings, what muſt be done? S. Multiply

S. Multiply the quantity by the price, and divide the product by 20, the quotient will be the anſwer.

NOTE, When the price is 5s. you may divide by 4, which gives the anſwer at once, 5s. being the fourth of a pound.

CASE VI.

M. What muſt be done with the price when it is ſhillings and pence; or ſhillings, pence and farthings?

S. If the ſhillings and pence be the aliquot part of a pound, it may be done at once by dividing by that part; but if the ſhillings and pence be not the aliquot part of a pound, or if there be ſhillings, pence, and farthings, I muſt multiply the quantity by the ſhillings, and take parts with the pence and farthings.

CASE VII.

M. What muſt be done with the price, when it is pounds only?

S. Multiply the quantity by the price, the product will the anſwer.

CASE VIII.

M. What muſt be done when the price is pounds and ſhillings?

S. Multiply by the pounds, and proceed with the ſhillings if they are even as in the 4th caſe; but if they are odd, as in caſe 5.

CASE

CASE IX.

M. What muſt be done when the price is pounds, ſhillings, and pence?

S. 1. If the ſhillings and pence be the aliquot part of a pound, multiply the given quantity by the pounds, and divide by the aliquot part.

2. If the ſhillings and pence be not the aliquot part of a pound, or if there be ſhillings, pence, and farthings, given with the pounds, I muſt reduce the pounds and ſhillings into ſhillings, and multiply the quantity by them; and then take parts with the reſt of the price, and add the whole together and divide by 20.

CASE X.

M. What muſt be done when the price and quantity given are of ſeveral denominations; for inſtance, ſuppoſe you have to find the value of 72cwt. 2qrs. 14lb. of Sugar, at 2l. 18s. 6d. per cwt?

S. I muſt multiply the price by the 72cwt. and take parts for the odd weight, as follows,

2	½	2	18	6	
				6	} 6 times 12 is 72.
		17	11	0	
				12	
lb		210	12	0	
14	¼	1	9	3	
			7	3¾	
		1,212	8	6¾	

THE following TABLE, ſhewing at ſo much per Pound, what is the value of an Hundred Weight, (or 112lb.) is very uſeful to all Perſons in Trade or Buſineſs. The Pupils are therefore recommended to get it by heart at their leiſure.

per lb.		s.	d.		per lb.		s.	d.	
¼	is	2	4	per Cwt.	6¼	is	58	4	per Cwt.
½	——	4	8		6½	——	60	8	
¾	——	7	0		6¾	——	63	0	
1d	——	9	4		7	——	65	4	
1¼	——	11	8		7¼	——	67	8	
1½	——	14	0		7½	——	70	0	
1¾	——	16	4		7¾	——	72	4	
2	——	18	8		8	——	74	8	
2¼	——	21	0		8¼	——	77	0	
2½	——	23	4		8½	——	79	4	
2¾	——	25	8		8¾	——	81	8	
3	——	28	0		9	——	84	0	
3¼	——	30	4		9¼	——	86	4	
3½	——	32	8		9½	——	88	8	
3¾	——	35	0		9¾	——	91	0	
4	——	37	4		10	——	93	4	
4¼	——	39	8		10¼	——	95	8	
4½	——	42	0		10½	——	98	0	
4¾	——	44	4		10¾	- l.	5	0	4
5	——	46	8		11	—	5	2	8
5¼	——	49	0		11¼	—	5	5	0
5½	——	51	4		11½	—	5	7	4
5¾	——	53	8		11¾	—	5	9	8
6	——	56	0		12	—	5	12	0

TARE

TARE *and* TRETT.

M. WHAT allowances are uſually made to the buyer in commodities that are liable to loſs or waſte?

S. They are Tare, Trett, and Cloff.

M. What is Tare?

S. Tare is an allowance made for the weight of the Box, Caſk, Bag, or whatever elſe contains the Goods bought; and is either,

1. At ſo much per Box, Caſk, Bag, &c.
2. At ſo much per Cent. or
3. At ſo much in the Groſs Weight.

M. What is Trett.

S. Trett is an allowance of 4lb. in 104, that is the 26th part for waſte, duſt, &c. in ſome ſorts of goods.

NOTE, If an allowance be made both for Tare and Trett, in the ſame parcel of Goods, the Tare is firſt to be deducted, and that remainder is called ſuttle Weight.

M. What is Cloff?

S. Cloff is an allowance of 2lb. to the Citzens of London, on every draught above 3 cwt. weight on ſome ſorts of goods, as galls, madder, argol, &c.

M. What are theſe allowances called abroad?

S. They are called the Courteſies of London, becauſe they are no where elſe practiſed.

M. What do you underſtand by Groſs Weight?

S. Groſs is the weight of any ſort of merchandize and that which contains it, being weighed together.

M. What is Neat Weight?

S. Neat Weight is the weight of any goods, after all allowances are deducted.

CASE

CASE I.

M. When the Tare is at ſo much per bag, barrel &c. how is the neat weight found?

S. By multiplying the number of the ſaid barrels, bags, &c. by the Tare, and ſubtracting that product from the groſs, the remainder is the neat weight.

CASE II.

M. When the Tare is at ſo much per cent. how will find the neat weight?

S. When the Tare is an aliquot part or parts of the cwt. I muſt divide the whole groſs weight by the ſaid part or parts that the Tare is of an cwt. and the quotient thence ariſing, gives the Tare of the whole, which ſubtracted from the groſs, will give the neat weight.

NOTE, When the Tare is not the aliquot part or parts of an cwt. multiply the pounds groſs by the Tare per cent. given, and divide that product by 112, the quotient is the whole Tare, which ſubtract from the groſs, the remainder is neat.

CASE III.

M. When the Tare is at ſo much in the whole groſs weight, how is the neat weight found?

S. By ſubtracting the Tare from the Groſs, the remainder is the neat weight.

CASE IV.

M. When Trett is allowed with Tare, how is the neat weight found?

S. Find

S. Find the Tare as before and ſubtract it from the Groſs, and the remainder will be the Suttle, which divided by 26 the quotient will be the Trett, which ſubtracted from the Suttle, the remainder will be the neat weight.

INTEREST.

M. HOW many kinds of Intereſt are there?

S. Two; Simple and Compound.

SIMPLE INTEREST.

M. What is Simple Intereſt?

S. It is the profit allowed for the uſe of any ſum of Money for a certain time.

M. What is the Principal?

S. The Principal is the Sum lent, for which Intereſt is to be received.

M. What is the Rate per cent.

S. It is the Sum agreed on between the lender and the borrower, to be paid for every 100 pounds, for the uſe of the principal, which accordiug to law, ought not to be more than 5 per cent. per annum; that is 5l. for the uſe of 100l. for 1 year, and 10l. for the uſe of 100l. for 2 years, and ſo on for any ſum of Money, in proportion to the time propoſed.

M. What is the Amount?

S. It is the Principal and Intereſt added together.

M. What elſe is Intereſt applicable to?

S. It is applied to Commiſſion, Brokage, and Inſurance, which have no reſpect to time.

CASE

CASE I.

M. How do you find the Intereſt of any Sum for a Year?

S. By multiplying the Principal by the Rate per Cent. and dividing that product by 100, the quotient is the Intereſt required.

M. How will you find the Intereſt of any Sum for ſeveral Years?

S. Multiply the Intereſt for one Year, by the number of Years given in the queſtion; the product will be the anſwer.

COMMISSION.

M. What is Commiſſion?

S. It is an Allowance which Merchants and others make to their Factors or Agents, in the buying or ſelling any ſort of Goods, and is at a certain Rate per Cent. according to the Cuſtom of the Country where the Factor reſides.

CASE II.

M. How will you find the Intereſt of any Sum for $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ of a Year, beſides the number of Years given in the queſtion?

S. For $\frac{1}{4}$ of a Year, I muſt take a fourth part of the Intereſt for one Year; for $\frac{1}{2}$ a Year, take half of the Intereſt for one Year; and for $\frac{3}{4}$ of a Year, I muſt take the parts compounded of $\frac{1}{4}$ and $\frac{1}{2}$ and add them to the Intereſt for the reſt of the time; the Sum will be the Intereſt required.

BROKAGE.

M. What is Brokage?

S. It is an Allowance made to Perſons called Brokers, for aſſiſting others in buying or ſelling of their Goods; which Allowance is at a certain Rate per Cent.

M. How do you find the Brokage of any Sum?

S. I muſt divide the given Sum by 100, and take parts from the quotient with the Rate per Cent.

INSURANCE.

M. What is Inſurance?

S. It is Security given by Perſons who oblige themſelves to anſwer for the loſs or damage of Ships, Houſes, or Goods, by Storms, Fire, &c. in conſideration of a Premium paid by the Proprietors of ſuch Ships, Houſes, or Goods.

CASE III.

M. How will you find the Intereſt of any Sum, when the Rate per Cent. is $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ more than the Pounds given?

S. I muſt multiply the Principal by the Pounds in the Rate per Cent. and take the parts for $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ from the Principal, and add them to that Product, then proceed according to Caſe 1 or 2.

PURCHASING *of* STOCKS.

M. What do you underſtand by the Stocks?

S. Stocks

S. Stocks are the public funds of the nation, the ſhares of which being transferable from one perſon to another, occaſion that extenſive buſineſs called ſtock-jobbing.

M. How will you find the purchaſe of any Sum in the Stocks?

S. By multiplying the Sum to be purchaſed, by the exceſs of the Rate per Cent. above 100; the product divide by 100, and the quotient added to the given ſum, will give the purchaſe required.

NOTE, If under 100 per cent. proceed as in laſt caſe.

CASE IV.

M. How do you find the Intereſt of any Sum for a certain number of Weeks?

S. By ſtating the Queſtion thus:

As 52 Weeks
Are to the Intereſt of the given Sum for a Year:
So are the Weeks given,
To the Intereſt required.

CASE V.

M. How is the Principal found, when the Amount, Time, and Rate per Cent. are given?

S. As the Amount of 100l. at the Rate and Time given,
Is to 100l.
So is the Amount given,
To the Principal required.

CASE

CASE VI.

M. How is the Rate per Cent. found, when the Amount, Time, and Principal are given?

S. As the Principal,
Is to the Intereſt for the whole Time:
So is 100l.
To its Intereſt for the ſame Time.
I muſt divide the Intereſt laſt found by the Time, and the Quotient will be the Rate per Cent.

CASE VII.

M. How is the Time found, when the Principal, Amount, and Rate per Cent. are given?

S. As the Intereſt of the Principal for 1 Year at the given Rate
Is to 1 Year:
So is the whole Intereſt,
To the Time required.

SIMPLE INTEREST *for* DAYS.

M. How will you find the Intereſt for any number of Days?

S. By multiplying the Pence of the Principal by the Days, and by the Rate of Intereſt for a Dividend, and 365 by 100 for a Diviſor, the Quotient will be the anſwer in Pence. Or thus,

As 365 Days
Are to the Intereſt of the given Sum for a Year:
So is the Time propoſed,
To the Intereſt required.

COMPOUND INTEREST.

M. What is Compound Intereſt?

S. Compound Intereſt is that which ariſes from any Principal and its Intereſt put together, as the Intereſt ſtill becomes due; and for that reaſon it is called Intereſt upon Intereſt or Compound Intereſt.

M. Is it lawful to let out Money at Compound Intereſt?

S. No; Yet in purchaſing of Annuities or Penſions, and Leaſes in Reverſion, it is very uſual to allow Compound Intereſt to the Purchaſer for his ready Money; and therefore it is very neceſſary to underſtand it.

M. How do you find the Compound Intereſt of any given Sum for any number of Years?

S. 1. Find the Amount of the given Sum by Simple Intereſt for the firſt Year; which is the Principal for the ſecond Year, then find the Amount of that Principal for the ſecond Year, and that is the Principal for the third Year; and ſo on for any number of Years given.

2. Subtract the given Sum from the laſt Amount, and the remainder is the Compound Intereſt required.

REBATE *or* DISCOUNT.

M. WHAT is Rebate or Diſcount?

S. It is the ſatisfying any Sum of Money due at ſome time to come, by paying ſo much preſent

preſent Money, as being put out to Intereſt, would Amount to the given Sum in the ſame ſpace of time.

M. How is the Operation performed?

S. 1. As 12 Months: Are to the Rate per Cent: : So is the Time propoſed: To a fourth Number.

2. Add that fourth Number to 100l. then ſay,

3. As that Sum: Is to the fourth Number: : So is the given Sum: To the Rebate.

4. Subtract the Rebate from the given Sum, and the Remainder is the preſent Worth.

M. How are Queſtions in Rebate proved?

S. By finding the Amount of the preſent Payment at the Time and Rate per Cent. given, and that will be equal to the given Sum.

EQUATION *of* PAYMENTS.

M. WHAT is Equation of Payments?

S. When ſeveral Sums of Money, to be paid at different times, are reduced to one mean Time for the Payment of the Whole, without Loſs to Debtor or Creditor; this is called Equation of Payments.

M. Wherein may the Debtor or Creditor be ſaid to ſuffer loſs, when the Debt is paid?

S. 1. When one mean time is aſſigned for the Payment of the whole Debt, and the Money is not paid till ſome time afterwards; then the Debtor ſuffers Loſs by paying not only the Principal, or Sum due, but alſo the Intereſt of that Sum for the time of Forbearance, at 3, 4, or more per Cent, as they

they ſhall agree. Likewiſe if the Money be paid before it is due, then the Creditor ſuffers loſs by allowing ſo much per Cent. by agreement, for the Time of prompt Payment.

2. The Loſs to either Party, may be in reducing the ſeveral Times of Payment to one, which is not the true equated Time; and then if the Payment be made after the true Time, the Creditor ſuffers Loſs, becauſe he receives no Intereſt for it: If the Time agreed on be before the true Time, then the Debtor ſuffers Loſs, becauſe he receives no Intereſt for his early Payment.

M. How will you find the equated Time for Payment?

S. By multiplying the Sum of each particular Payment by the Time it is to continue in the hands of the Debtor, then add the Products together, and divide the Sum by the whole Debt, the Quotient will be the equated Time.

BARTER.

M. WHAT is Barter?

S. Barter is the exchanging of one Commodity for another, and informs Merchants ſo to proportion their Goods, that neither may ſuſtain loſs or diſadvantage by ſuch Barter or Exchange.

M. How is the Operation performed?

S. 1. Find the Value of that Commodity, whoſe Quantity is given; then find what Quantity of the other at the given Rate, you can have for the aforeſaid Value, which Quantity will be the anſwer.

2. When

2. When one has Goods at a certain Price ready Money, but in Barter advances it to ſomething more, ſay, as the ready Money price of the one : is to its bartering price :: ſo is the ready Money price of the other: to its bartering price; then the Quantity of the latter Commodity may be found either from the ready Money or Bartering Price.

LOSS *and* GAIN.

M. WHAT is Loſs and Gain ?

S. Loſs and Gain is a Rule by which Perſons in Trade and Buſineſs, know what they get by Retailing Goods; and in caſe of Damage, what they loſe by Selling it at any given Rate ; and whether they gain or loſe, to know at what Rate per Cent.

M. What is the Rule ?

S. When there is Gain per Cent. add the Gain per Cent. to 100l. but when there is Loſs per Cent. ſubtract as much as you Loſe per Cent. from 100l. the ſum or difference is the third number in the Rule of Three.

SINGLE FELLOWSHIP:

Or, Fellowſhip without Time.

M. WHAT is Single Fellowſhip ?

S. Single Fellowſhip is when two or more Perſons join their Stocks and Trade together, and continue for an equal term of Time.

M. When

M. What is the Rule?

S. As the Sum of the ſeveral Stocks: is to the total Gain or Loſs: : ſo is each Perſon's ſhare in Stock: to his ſhare of the Gain or Loſs.

M. How will you prove this Rule?

S. By adding all the ſhares together, the Sum will be equal to the whole Gain or Loſs.

NOTE, This Method of proving Fellowſhip will not hold good always: Therefore the moſt exact Method, is to put each Perſon's Share of the Gain or Loſs in the place of his Stock firſt laid out, and make the Sum of the Stocks ſtand in the Place of the whole Gain or Loſs, and then ſay,

As the Total Gain or Loſs
Is to the Sum of the ſeveral Stocks:
So is each Perſon's Share of the Gain or Loſs
To his particular Share in Stock.

M. What elſe is this Rule applicable to?

S. By it the Eſtate of a Bankrupt may be divided among his Creditors: Or, Legacies may be adjuſted, where there is a deficiency of Effects.

DOUBLE FELLOWSHIP:

Or, Fellowſhip with Time.

M. WHAT is Double Fellowſhip?

S. Double Fellowſhip is when the Stocks continue an unequal Term of Time.

M. What is the Rule?

S. 1. Multiply each Perſon's Stock and Time together.

2. Add

2. Add the ſeveral Products thence ariſing together; and ſay,

3. As the Sum of thoſe Products
Is to the whole Gain or Loſs:
So is each Product,
To its Share of the Gain or Loſs.

M. How are you to prove this Rule?

S. The ſame as in Single Fellowſhip.

EXCHANGE.

M. WHAT is Exchange?

S. Exchange is the receiving Money in one Country, for the ſame Value paid in another.

M. What is the Courſe of Exchange?

S. It is the Value of Money agreed on between Merchants.

M. Is the Courſe of Exchange always the ſame?

S. No: The Courſe of Exchange riſes and falls upon various occaſions, according to circumſtances and accidents in Trade, or as Money is plenty or ſcarce, being ſometimes above and ſometimes below the Par.

M. What do you underſtand by the Par of Exchange?

S. It is the Intrinſic, or Real Value of any Foreign Money compared with Sterling.

Note, It would be endleſs to treat of every kind of Exchange, I ſhall therefore only give Examples of the Exchange between England and ſome of the chief Countries in Europe.

I. FRANCE

I. *FRANCE.*

M. How do they keep their Accompts in France?

S. They keep their Accompts at Paris, Lyons, and Rouen, in Livres, Sols, and Deniers.

Note, 12 Deniers make 1 Sol.
20 Sols —— 1 Livre.
3 Livres —— 1 Crown.

M. What is the Par of Exchange between London and France?

S. One Livre is worth 18d. and one Crown is worth 4s. 6d. ſterling.

M. How will you change French Money into Sterling?

S. As 1 Crown : is to the given Rate : : ſo is the French Sum : to the Sterling Money.

M. How will you change Sterling Money into French?

S. As the Rate of Exchange : is to 1 Crown : : ſo is the Sterling Sum : to the French required.

Note, The ſame Rule is to be obſerved with moſt of the following Countries.

II. *SPAIN.*

M. How do they keep their Accompts in Spain?

S. They keep their Accompts at Madrid, Cadiz, and Seville, in Rials, and Marvadies, and Exchange by the Dollar or Piece of Eight, whoſe Par is 4s. 6d. ſterling.

Note,

Note, 34 Marvedies make 1 Rial.
8 Rials —— 1 Piece of Eight or Dollar.

III. *ITALY.*

M. How do they keep their Accompts in Italy?
S. In Livres, Sols, and Deniers; and Exchange by the Piece of Eight, or Dollar, which is equal to 4s. 6d. at Par.

Note, 12 Deniers make 1 Sol.
20 Sols —— 1 Livre.
5 Livres —— 1 Piece of Eight at Genoa.
6 Livres —— 1 Piece of Eight at Leghorn.
At Florence the Exchange is in Ducatoons, and at Venice by Ducats.
6 Solidi make 1 Groſs.
24 Groſs —— 1 Ducat.

IV. *PORTUGAL.*

M. How do they keep their Accompts in Portugal?
S. They keep their Accompts in Oporto and Liſbon, in Milreas and Reas, and Exchange by the Milrea, one Milrea being worth 5s 7d.$\frac{1}{2}$ at Par.

Note, 1000 Reas make 1 Milrea.

V. *Holland, Flanders, & Germany.*

M. How do they keep their Accompts in theſe Countries?

Some in Pounds, Shillings and Pence, as in England; others in Guilders, Stivers, and Pennings. In Holland and Flanders the Money is diſtinguiſhed by the name of Flemiſh; Exchange being made with London from 30s. to 38s. Flemiſh per Pound Sterling.

Note, 16 Pennings make 1 Stiver.
20 Stivers —— 1 Guilder.
6 Stivers —— 1 Schelling.
6 Guilders —— 1 Pound Flemiſh.

M. How will you change Flemiſh Money into Sterling?

S. As the given Rate: is to 1 Pound:: ſo is the Flemiſh Sum: to the Sterling required.

M. How is Sterling brought into Flemiſh?

S. As 1l. Sterling: is to the given Rate:: ſo is the Sterling given: to the Flemiſh.

Of reducing the Current Money of HOLLAND *into Bank-Money, & the contrary.*

M. What is meant by Bank-Notes, or Bank-Money?

S. Bank-Notes are obtained from foreign Bankers for Money lodged in their Banks, which Money is called Bank-Money.

M. What is meant by Current-Money?

S. It is ſuch as paſſes from Hand to Hand, in the receiving and paying ſuch Sums as are due from one Man to another, commonly called Running Caſh.

Note

Note, The Bank-Money is worth more than the Current. The difference between one and the other is called Agio.

M. How is Bank changed into Current Money?

S. As 100 Guilders Bank: is to 100 with the Agio added: : ſo is the Bank given: to the Current required.

M. How is Current Money changed into Bank?

S. As 100 Guilders with the Agio added: is to 100 Bank: : ſo is the Current Money given: to the Bank required.

VI. *Ireland, America, & Weſt-Indies.*

M. How do they keep their Accompts in Ireland, America, and Weſt-Indies?

S. The ſame as we do in England, in Pounds, Shillings and Pence; but with this difference, that in England they call their Money Sterling, but in all the Weſtern Dominions they call it Currency.

M. Why is the Money called Currency in the Weſtern Dominions?

S. Becauſe the ſcarcity of Caſh obliges them to ſubſtitute a Paper Currency for carrying on their Trade; which being ſubject to Caſualties. it cauſes a very great undervaluement of their Currency, and conſequently ſuffer a great diſcount for Sterling, in the purchaſe of Bills of Exchange.

Note, 1. The Par of Exchange between England and Ireland, is 100l. Sterling for 108l. 6s. 8d. or 1s. Engliſh for 13d. Iriſh.

2. The Courſe of Exchange is from 5 to 12 per cent. according to the Ballance of Trade.

VII. GENEVA,

VII. *GENEVA, in Switzerland.*

M. How do they keep Accompts in Geneva?

S. In Livres, Sols, and Deniers, and Exchange by the Rix-Dollar.

Note, 12 Deniers make 1 Sol.
20 Sols —— 1 Livre.
3 Livres —— 1 Rix-Dollar.

The Par is, that 1 Rix-Dollar is equal to 4s. 6d. ſterling, but in Exchange it goes from 50d. to 60d. ſterling.

VIII. *DENMARK.*

M. How do they keep their Accompts in Denmark?

S. In Marks and Shillings, and Exchange by the Rix-Dollar, one of which being valued at 4s. 6d. Sterling.

Note, 16 Shillings make 1 Mark.
6 Marks —— 1 Rix-Dollar.

The Rix-Dollar in Exchange goes from 45d to 58d ſterl.

IX. *STOCKHOLM, in Sweden.*

M. How do they keep their Accompts in Stockholm?

S. In Rix-Dollars, Copper-Dollars, and Runſtics.

Note, 1. 32 Runſtics make 1 Copper-Dollar.
6 Copper-Dollars - 1 Rix-Dollar.

2. The Par of the Rix-Dollar is equal to about 6s. Sterling, conſequently the Par of the Copper-Dollar is equal to 1s. ſterling, or 20 Copper-Dollars make 1l. Sterling, but the Courſe of Exchange is ſometimes to 28 or 30 Copper-Dollars per l. Sterling.

THE

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DOUBLE RULE *of* THREE.

BY what is the Double Rule of Three known?

S. By having five Terms always given in the Queſtion to find a Sixth.

M. In what Proportion is the Sixth Term to be found?

S. If the Proportion is Direct, the Sixth Term muſt bear ſuch Proportion to the Fourth and Fifth, as the Third bears to the Firſt and Second: But if Inverſe, the Sixth Term muſt bear ſuch Proportion to the Fourth and Fifth, as the Firſt bears to the Second and Third, or as the Second bears to the Firſt and Third.

M. What are you to obſerve concerning the five given Terms?

S. That the three firſt are a Suppoſition, and two laſt a Demand.

M. How are the Numbers given in the Queſtion to be ſtated?

S. By two Statings in the Single Rule of Three: or elſe by one Stating, thus;

1. The Principal Cauſe of Loſs or Gain, Intereſt or Decreaſe, Action or Paſſion, muſt be put in the firſt Place.

2. That which betokeneth Time, Diſtance of Place, and the like, muſt be put the ſecond Place; and the remaining one in the Third Place.

3. Place the other two Terms under their like in the Suppoſition,

4. If

4. If the Blank falls under the Third Term, multiply the firſt and ſecond Terms together for a Diviſor, and the other three for a Dividend.

5. If the Blank falls under the firſt or ſecond Term, multiply the third and fourth Terms together for a Diviſor, and the other Three for a Dividend, and the Quotient will be the Anſwer.

M. How will you prove Queſtions in this Rule?

S. By varying them, or elſe work them by two Single Rules of Three.

CONJOINED PROPORTION.

M. What is Conjoin'd Proportion?

S. Conjoin'd Proportion is when the Coins, Weights, or Meaſures of ſeveral Countries, are compared in the ſame Queſtion; or it is a linking together of many Proportions.

CASE I.

M. How are Queſtions anſwered in this Caſe?

S. When it is required to know how many of the firſt ſort of Coin, Weight, or Meaſure, mentioned in the Queſtion, are equal to a given Number of the laſt; I muſt

1. Place the Numbers alternately, beginning at the left Hand, and let the laſt Number ſtand on the left Hand.

2. Multiply the firſt Rank continually for a Dividend, and the ſecond for a Diviſor.

M. How is Conjoin'd Proportion proved?

S. By making as many Single Rules of Three as the Nature of the Queſtion requires.

CASE

CASE II.

M. How are Queſtions anſwered in this Caſe?

S. If it be required to find how many of the laſt ſort of Coin, Weight, or Meaſure, mentioned in the Queſtion, is equal to a given Quantity of the firſt?

1. Place the Numbers alternately, as in Caſe 1, but let the laſt Number ſtand on the right Hand.

2. Multiply the firſt Rank for a Diviſor, and the ſecond for a Dividend.

ALLIGATION.

M. HOW many kinds of Alligation are there?

S. Two: Alligation Medial, and Alligation Alternate.

ALLIGATION MEDIAL.

M. What is Alligation Medial?

S. It is when the Quantities and Prices of ſeveral Simples are given to be mixed, to find the mean Price of that mixture.

M. What is the Rule?

S. As the whole Compoſition: is to its Total Value : : ſo is any Part of the Compoſition: to its mean Price.

M. How is this proved?

S. By finding the Value of the whole Mixture at the Mean Rate, and if it agrees with the Total Value of the ſeveral Quantities, at their reſpective Prices, the Work is right.

ALLIGATION ALTERNATE.

M. What is Alligation Alternate?

S. It is when the Prices of ſeveral things are given to find ſuch Quantities of them to make a Mixture, that may bear a certain Price propounded.

M. How are the Prices of the given Things to be ordered?

S. 1. They muſt be placed one over the other, and the propounded Price of the Compoſition againſt them.

2. Link the ſeveral Rates together, in ſuch ſort, that one greater than the mean Rate may be coupled to another which is leſs.

3. Take the Differences between the mean Rate, and the ſeveral Prices, and place them each againſt his Yoke-Fellow: And for the reſt obſerve the following Caſes.

CASE I.

M. What are you to obſerve in this firſt Caſe?

S. That the Prices of the ſeveral Things, together with the mean Rate of the Mixture are given, without any Quantity, to find how much of each Ingredient is required to compoſe the Mixture; take the Differences between each Price and the mean Rate and ſet them alternately, and they will be the Quantities required.

Note, Queſtions in this Rule are proved by Alligation Medial.

CASE

CASE II.

Alternation Partial.

M. What do you obſerve in this ſecond Caſe?

S. When the Rates of all the Things, the Quantity of but one of them, and the mean Rate of the whole Mixture are given, to find the ſeveral Quantities of the reſt, in proportion to the Quantity given; take the Difference between each Price and the mean Rate, and place them alternately, as in Caſe 1. Then ſay,

As the Difference of the ſame Name with the Quantity given,
Is to the reſt of the Differences ſeverally:
So is the Quantity given,
To the ſeveral Quantities required.

CASE III.

Alternation Total.

M. What do you obſerve in this third Caſe?

S. When the Rates of the ſeveral Things, the Quantity to be compounded, and the mean Rate of the whole Mixture are given, to find how much of each ſort will make up the Quantity; place the Differences between the ſeveral Prices, and the mean Rate, alternately as in Caſe 1. Then ſay,

As the Sum of the Differences,
Is to the whole Compoſition:
So is the Difference of each Rate,
To the Quantity of the ſame Rate.

POSITION.

Or, The Rule of False.

M. WHAT is Position?

S. It is a Rule which by false or supposed Numbers, taken at pleasure, discovers the true ones required.

M. How many kinds of Position are there?

S. Two: Single and Double.

SINGLE POSITION.

M. What is Single Position?

S. It discovers by one supposed Number, the real or true Number required.

M. How is the supposed Number to be used?

S. By working with it in the same manner as if it was the true Number, in such proportion as the Question directs; and in Case the Result is either too much, or too little, the true Number may be found by the following Rule, viz.

As the Result of the Position,
Is to the Position:
So is the given Number,
To the Number required.

M. How do you prove Position?

S. By adding the several Sums required, or the several Parts of the Sum required together; and if that Sum agrees with the given Sum, it is right.

DOUBLE POSITION.

M. What is Double Poſition?

S. It is that which diſcovers the true Number ſought, by making uſe of two ſuppoſed Numbers.

M. How are the ſuppoſed Numbers to be uſed?

S. 1. By working with them as if they were the true Numbers, in the ſame proportion as the Queſtion directs.

2. The Reſults or Errors muſt be placed againſt their Poſitions, or ſuppoſed Numbers; thus,

Poſ.	Er.
30	9
20	4

3. Multiply them Croſs-wiſe.

4. If the Errors are alike; that is, both greater, or both leſs than the given Number, take the difference for a Diviſor, and the Difference of the Products for a Dividend.

5, If the Errors are unlike, take their Sum for a Diviſor, and the Sum of the Products for a Dividend, the Quotient thence ariſing will be the anſwer.

ARITHMETICAL PROGRESSION.

M. WHAT is Arithmetical Progreſſion?

S. Arithmetical Progreſſion is when ſeveral Numbers have equal Differences; as 1, 2, 3, 4, differ by 1; or 2, 4, 6, 8, differ by 2.

CASE I.

M. What do you obſerve in this firſt Caſe?

S. When the two Extremes, and the Number of Terms

Terms in any Series of Numbers in Arithmetical Progreſſion are given, and the Sum of all the Terms is required, then multiply the Sum of the two Extremes by half the number of Terms : Or,

Multiply half the Sum of the Extremes by the whole Number of Terms, the Product is the Total of all the Terms.

C A S E II.

M. What do you obſerve in this ſecond Caſe ?

S. When the two Extremes, and the Number of Terms in any Series of Numbers in Arithmetical Progreſſion are given, and the common Difference of all the Terms in that ſeries are required, then

Divide the Difference between the two Extremes by the Number of Terms, leſs one ; the Quotient will be the common Difference.

GEOMETRICAL PROGRESSION.

M. WHAT is Geometrical Progreſſion ?

S. It is when any Rank or Series of Numbers increaſes by one common Multiplier, or decreaſes by one common Diviſor, thoſe Numbers are continued in Geometrical Progreſſion ; as 3, 6, 12. 24, increaſe by the Multiplier 2 ; and 24, 12, 6, 3, decreaſe by the Diviſor 2.

Note, 1. In any Series of Numbers in Geometrical Progreſſion, the Product of the two Extremes are equal to the Product of any two Means that are equally diſtant from the Extremes.

As, 3, 9, 27, 81, 243, 729. 2. When

2. When the Number of Terms are odd, the middle Term multiplied into itſelf, will be equal to the Product if the two Extremes, or any two Means equally diſtant from the ſaid Mean or middle Term.

3. The common Multiplier, and the common Diviſor are called Ratios.

M. How is the Sum of any Series in Geometrical Progreſſion obtained?

S. 1. When all the Terms alone are given, then from the Product of the ſecond and laſt Terms ſubtract the Square of the firſt Term: that Remainder being divided by the ſecond Term leſs the firſt, will give the Sum of all the Terms.

2. When the two Extremes and the Ratio are only given, then multiply the laſt Term into the Ratio, and from that Product ſubtract the firſt Term: That Remainder divide by the Ratio leſs an Unit or 1, the Quotient is the Sum of all the Terms.

Note, 1. As the laſt Term in a long Series of Numbers is very tedious to come at by continual Multiplication; it would be neceſſary, for the readier finding it out, to have a Series of Numbers in Arithmetical Proportion, called Indices, beginning with an Unit, whoſe common Difference is One: Alſo, whatſoever Number of Indices you make choice of, let as many Numbers (in ſuch Geometrical Proportion as are given in the Queſtion) be placed under them,

Thus, { 1, 2, 3, 4, 5, 6, 7, Indices.
{ 2, 4, 8, 16, 32, 64, 128, Numbers in Geometrical Proportion.

2. But if the firſt Term in Geometrical Proportion be different from the Ratio, the Indices muſt begin with a Cypher.

Thus,

Thus, { 0, 1, 2, 3, 4, 5, 6, Indices.
1, 2, 4, 8, 16, 32, 64, Numbers in Geometrical Proportion.

3. When the Indices begin with a Cypher, the Sum of the Indices made choice of, muſt always be one leſs than the Number of Terms given in the Queſtion; becauſe 1 in the Indices ſtands over the ſecond Term, and 2 in the Indices ſtands over the the third Term, &c.

4. Add any two of theſe Indices together, and that Sum will directly correſpond with the Product of their reſpective Terms.

5. By the help of thoſe Indices, and a few of the firſt Terms, in any Series of Geometrical Progreſſion, any Term, whoſe diſtance from the firſt Term is aſſigned, tho' it were never ſo far, may ſpeedily be obtained, without producing all the Terms.

PERMUTATION.

M. WHAT is Permutation?

S. It is Changing or Varying the Order of Things.

M. How will you find all the Variations any Number of Things is capable of going through?

S. Multiply all the given Terms one into another continually; the laſt Product is the Number of Changes required.

FINIS.

9 14 b 17 11 b

9 1-0 b

5 4 2 8 5 ½

1-1

11 9 10

Allegro

214 ½

135

376 ½